

There were forty-nine omissions to predict out of 3,813, or 1.29 per cent. Of the 3,764 predictions that have been made, one hundred and twenty-nine, or 3.43 per cent., are considered to have entirely failed; one hundred and thirty-one, or 3.48 per cent., were one-fourth verified; four hundred and forty-seven, or 11.88 per cent. were one-half verified; four hundred and seventy-one, or 12.51 per cent., were three-fourths verified; 2,586, or 68.70 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During December, 1883, two hundred and eight cautionary signals were displayed. Of these, one hundred and eighty-six, or 89.4 per cent., were justified by winds of twenty-five miles, or more, per hour, at or within one hundred miles of the station. Sixty-six cautionary off-shore signals were displayed, of which number sixty, or 90.9 per cent., were justified both as to direction and velocity; and sixty-one, or 92.4 per cent., were justified as to direction. There were no "northwest" signals ordered on the lakes during the month. Two hundred and seventy-four signals of all kinds were displayed, of which two hundred and forty-six, or 89.8 per cent., were fully justified. These do not include signals ordered at display stations where the velocity is only estimated. Six signals were ordered late. Of the sixty-six cautionary off-shore signals that were displayed, twenty-five were changed from cautionary signals.

Seventy-nine cases have been reported from the various signal stations in which the maximum hourly velocity of the wind reached twenty-five or more miles, and for which signals had not been ordered to be displayed. These were from scattered stations as a rule, and it is not believed that any damage resulted from dangerous winds, as generally fair weather prevailed. On the 1st signals were ordered up for all lake stations excepting Duluth, Marquette, and Escanaba; subsequent changes proved that signals should have been hoisted at those stations also, as high northwesterly winds prevailed over that region on the 1st and 2d in the western quadrants of low area i., but with generally fair weather. At Buffalo and Rochester the signals were lowered too soon on the 8th. High westerly winds occurred on Lakes Michigan and Huron, night of the 9th, and 10th, during the progress of low area v., for which signals had not been ordered, but fair weather was general; the lower lake stations were warned, morning of the 10th. High northeasterly winds, with rain, were reported from the central portion of the North Carolina coast on the 9th, for which signals should have been displayed. The "norther," for which off-shore signals were displayed on the Texas coast on the 13th, 14th, and 15th, extended eastward across the Gulf; if signals had been displayed at New Orleans and Cedar Keys they would have been justified, as velocities of n. 28 and nw. 29 miles, respectively, were registered. On the 14th signals were ordered up along the coast from Maine to Cape Hatteras, in advance of low area vii., but high westerly winds also occurred along the southern portion of the North Carolina coast. For the storm, low area xii., which appeared off the middle Atlantic coast on the 21st, no signals were ordered, and high northeast backing to northwest winds were produced along the New Jersey and New England coasts. At midnight of the 24th, after low area xiv. had passed northeastward along the New England coast, the signals were lowered, but subsequent reports proved that at Block Island and the New Jersey coast stations they should have been retained twenty-four hours longer.

Professor T. C. Mendenhall, director of the Ohio Meteorological Bureau, in his report for December, 1883, says:

It is found, from special reports made to the bureau, that the percentage of verifications of the railway train weather signals was eighty-six per cent. for the month of December.

These signals consist of colored symbols, displayed from the sides of the baggage cars of the Cleveland, Akron, and Columbus railroad company, representing the daily forecasts, as telegraphed from the Office of the Chief Signal Officer to said bureau.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at the Signal Service stations during December, 1883, with the average depth at which the observations were made, and the mean temperature of the air at the several stations, are shown in the following table. On account of ice-formation observations were not made at the following stations on the dates named: Alpena, Michigan, from 16th to 31st; Mackinaw City, Michigan, on the 14th and 15th, and from 17th to 31st; Escanaba, Michigan, on the 15th, 16th, and 17th, and from 19th to 31st; at Chicago, Illinois, Duluth, Minnesota, Marquette, Michigan, Milwaukee, Wisconsin, and Toledo, Ohio, from 17th to 31st; Sandusky, Ohio, from 16th to 31st; Detroit, Michigan, from 22d to 31st; Grand Haven, Michigan, on 22d and 23d; Buffalo, New York, on 23d, 24th, 25th, 29th, 30th, 31st; Boston, Massachusetts, 23d. The highest temperatures observed during the month are reported from Key West, Florida, (76° 9 on the 28th); Cedar Keys, Florida, (74° on 7th); and Galveston, Texas, (69° on 23d). The largest monthly ranges are: 34° 1 at Cedar Keys, Florida; 24° 3 at Toledo, Ohio, (record from 1st to 16th); 19° at Galveston. The smallest monthly ranges are: 2° 3 at San Francisco, California; 5° 4 at Portland, Oregon; 5° 7 at Savannah, Georgia.

Temperature of water for December, 1883.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	47.1	35.6	11.5	5 11	37.2
Alpena, Michigan*.....	34.7	30.5	4.2	11 9	33.3
Augusta, Georgia.....	56.0	46.0	10.0	6 2	53.2
Baltimore, Maryland.....	45.0	35.0	10.0	9 10	39.0
Block Island, Rhode Island.....	47.2	30.8	16.4	8 3	38.0
Boston, Massachusetts*.....	41.0	29.5	11.5	22 5	28.7
Buffalo, New York.....	40.2	32.2	8.0	10 0	34.0
Cedar Keys, Florida.....	74.2	40.1	34.1	11 7	67.1
Charleston, South Carolina.....	58.7	51.9	6.8	40 1	56.0
Chicago, Illinois.....	38.9	34.3	4.6	8 1	30.1
Chincoteague, Virginia.....	49.0	32.5	16.5	5 0	40.9
Cleveland, Ohio.....	41.2	32.0	9.2	14 0	32.2
Detroit, Michigan*.....	39.2	33.0	6.2	22 2	33.5
Delaware Breakwater, Delaware.....	48.2	37.8	10.4	7 7	39.5
Duluth, Minnesota.....	36.6	35.1	1.5	14 10	15.7
Eastport, Maine.....	43.7	37.5	6.2	16 2	23.4
Escanaba, Michigan*.....	38.5	31.5	7.0	15 0	20.1
Fort Canby, Washington Territory.....	47.0	37.2	9.8	17 6	44.2
Fort Macon, North Carolina.....	58.7	49.0	9.7	2 11	50.0
Galveston, Texas.....	69.0	50.0	19.0	10 7	60.2
Grand Haven, Michigan*.....	37.8	31.6	6.2	19 0	30.6
Indianola, Texas.....	67.7	50.0	17.7	8 0	59.5
Jacksonville, Florida.....	65.0	56.0	9.0	18 0	60.5
Key West, Florida.....	76.9	71.0	5.9	17 8	71.5
Mackinaw City, Michigan*.....	38.5	31.6	6.9	10 0	24.9
Marquette, Michigan*.....	36.0	34.0	2.0	9 10	21.1
Milwaukee, Wisconsin.....	37.5	34.5	3.0	8 0	26.4
Mobile, Alabama.....	62.0	53.0	9.0	14 4	56.4
New Haven, Connecticut.....	40.3	31.2	9.1	15 6	29.7
New London, Connecticut.....	40.0	38.0	2.0	12 7	31.5
New York City, Connecticut.....	44.0	31.3	12.7	10 4	33.7
Norfolk, Virginia.....	49.5	42.0	7.5	16 7	46.4
Pensacola, Florida.....	63.9	56.6	7.3	16 8	57.9
Portland, Maine.....	40.0	30.5	9.5	14 10	27.7
Portland, Oregon.....	46.1	40.7	5.4	56 5	41.8
Provincetown, Massachusetts.....	43.8	29.3	14.5	11 1	32.9
Sandusky, Ohio.....	40.5	35.0	5.5	9 8	33.3
Sandy Hook, New Jersey.....	45.0	35.8	9.2	1 6	35.4
San Francisco, California.....	52.1	49.8	2.3	39 8	50.2
Savannah, Georgia.....	57.0	51.3	5.7	11 9	57.1
Smithville, North Carolina.....	64.5	50.2	14.3	10 0	51.7
Toledo, Ohio.....	58.9	34.3	24.6	10 6	32.7
Wilmington, North Carolina.....	54.0	47.0	7.0	20 10	52.8

*Observations interrupted by ice; see text.

ATMOSPHERIC ELECTRICITY.

AURORAS.

There were no unusually brilliant or widely-extended auroral displays observed in the United States during December. The most noteworthy display of the month occurred on the night of the 1st. This display was noted by scattering observers from eastern New England to northwestern Dakota, the most numerous reports coming from the upper lake region. The following notes relating to this display have been received:

Eastport, Maine, 1st.—A faint auroral arch was observed, from 6.40 to 7.40 p. m.

Gardiner, Maine, 1st.—A brilliant auroral light, extending from northwest to northeast, was observed at 6 p. m.

Voluntown, Connecticut, 1st.—A faint auroral light was visible during the evening.

Eric, Pennsylvania.—An auroral light of moderate brilliancy was visible from 12.20 to 2 a. m. of the 2d.

Cleveland, Ohio, 1st.—An auroral light was visible until midnight, the light extending from northwest to east.

Grand Haven, Michigan.—A faint auroral display was noted from 9 p. m. of the 1st to 2 a. m. of the 2d.

Escanaba, Michigan, 1st.—A diffuse auroral light was observed from 7.25 to 9.58 p. m.

Fort Buford, Dakota, 1st.—An auroral arch of pale white formed at 8 p. m., having an altitude of 40°, and extending from northwest to northeast. The display disappeared at 11.18 p. m.

The following stations also report the display of the 1st, the description given being similar to those published above: Bangor and Cornish, Maine; Fall River, Massachusetts; Escanaba, Michigan; Riley, Illinois; Cresco, Humboldt, and Monticello, Iowa; Manitowoc, Wisconsin; Moorhead and Saint Vincent, Minnesota; Fort Totten and Webster, Dakota; Madison and Sussex, Wisconsin.

Other displays occurred as follows:

On the summit of Mount Washington a faint aurora was observed during the early morning of the 1st.

Moorhead, Minnesota, 2d.—An auroral light, extending from the magnetic meridian to points 15° east and west, was observed at 9 p. m. It consisted of a straw-colored arch from which occasional beams extended upward. The display ended at 11 p. m. An auroral display was also observed on that date at Humboldt, Iowa.

Manitowoc, Wisconsin, 5th.—An aurora was observed at 5.30 p. m., appearing as a bright red spot in the northeastern sky, at an altitude of 15°.

Saint Vincent, Minnesota, 10th.—From 6 p. m. until daylight a faint auroral arch was observed in the north.

Clear Creek, Nebraska, 19th.—Bright auroral streamers were observed at 7.30 p. m.

Fort Totten, Dakota, 24th.—An aurora was visible in the northern sky from 8 to 11.30 p. m. The light was of a pale straw color, the upper limit being well-defined. A complete arch was formed, beneath which appeared a dark segment.

Escanaba, Michigan, 27th.—A faint aurora consisting of two straight bands of straw-colored light, with a dark base, was observed from 9.45 to 11.20 p. m.

Washington City, District of Columbia, 28th.—At 9 p. m. an aurora was observed, consisting of a narrow band of pale yellow light extending across the northwestern sky, and forming an imperfect arch, beneath which was the usual dark base.

Saint Vincent, Minnesota, 28th.—An auroral arch was observed from 5.30 a. m. until daylight.

THUNDER-STORMS.

Thunder-storms were reported from the various states and territories as follows:

Alabama.—Auburn, 24th.

Arizona.—At numerous stations on the 4th, and at Prescott on the 3d.

Arkansas.—Mount Ida, 5th, 6th, 13th; Fort Smith, 5th, 23d; Little Rock, 23d.

California.—Cape Mendocino, 23d.

Connecticut.—Of general occurrence on the 27th.

Florida.—Jacksonville, 3d; Newport, 14th, 25th, 27th; Pensacola, 24th, 26th; Limona, 27th; Archer, 27th; Cedar Keys, 31st.

Georgia.—Andersonville, 26th; Savannah, 27th.

Illinois.—Cairo, 23d; Springfield, 23d; Anna, 23d, 31st.

Indiana.—Rising Sun, 9th, 21st, 26th.

Iowa.—Humboldt, 6th.

Kansas.—Allison, 5th; Fort Scott, 5th; Independence, 5th; Wellington, 5th, 22d.

Kentucky.—Louisville, 31st.

Louisiana.—New Orleans, 7th; Grand Coteau, 7th, 30th; Liberty Hill, 6th, 24th, 29th, 30th.

Maine.—Gardiner, 7th; Portland, 7th.

Massachusetts.—Of general occurrence throughout the state on the 27th, and at Charlestown on the 20th; Cambridge, 28th.

Mississippi.—Vicksburg, 7th, 29th, 30th, 31st.

Nebraska.—De Soto, 6th; Genoa, 6th.

New Jersey.—Cape May, 2d; Moorestown, 29th; Sandy Hook, 27th; Vineland, 27th.

New York.—Flushing, 27th; New York City, 27th.

North Carolina.—Kitty Hawk, 1st, 2d, 5th, 26th; Weldon, 2d, 27th; Ocreeta, 24th; Smithville, 25th, 27th; New River Inlet, 26th; Fort Macon, 27th.

Pennsylvania.—Fallsington, 27th.

Rhode Island.—Block Island, 27th; Narragansett Pier, 27th; Point Judith, 27th.

South Carolina.—Charleston, 27th.

Tennessee.—Memphis, 7th, 23d, 24th; Ashwood, 23d; Nashville, 23d, 24th; Milan, 30th.

Texas.—Cleburne, 5th; Fort Concho, 5th, 6th; Barnesville, 5th, 26th, 30th; Galveston, 6th, 24th, 26th, 29th; Indianola, 6th, 26th, 29th.

Vermont.—Dorset, 9th, 27th.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England.—11th, 23d, 24th, 26th.

Middle Atlantic states.—3d, 13th, 14th, 23d, 29th, 30th.

South Atlantic states.—4th, 7th, 10th, 11th, 18th.

Eastern Gulf states.—4th, 8th to 11th, 13th.

Ohio valley.—6th, 12th, 29th.

Lower lakes.—1st, 7th, 12th, 13th, 17th, 19th, 20th, 26th, 29th.

Upper lakes.—3d, 13th, 15th, 16th, 17th, 19th, 20th, 26th.

Extreme northwest.—10th, 17th, 18th, 24th, 25th, 31st.

Upper Mississippi valley.—3d, 9th, 10th, 12th, 13th, 16th to 20th, 26th, 29th.

Missouri valley.—11th, 19th, 20th, 26th, 31st.

Solar halos were also observed at the following stations not situated in the districts named above:

Arkansas.—Lead Hill, 2d, 5th, 10th, 11th, 12th; Little Rock, 11th.

California.—San Francisco, 1st, 8th, 10th, 19th, 23d, 31st.

Florida.—Archer, 5th, 8th; Jacksonville, 5th.

Kansas.—Salina, 10th.

Oregon.—Roseburg, 8th.

Tennessee.—Chattanooga, 6th; Milan, 28th.

Washington Territory.—Bainbridge island, 10th.

Wyoming.—Fort Bridger, 2d.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

New England.—7th, 9th to 13th, 16th, 19th.

Middle Atlantic states.—4th, 6th, 7th, 8th, 12th to 15th, 17th.

South Atlantic states.—4th, 6th to 11th, 13th, 17th.

Florida peninsula.—7th to 10th, 13th, 18th.

Eastern Gulf states.—5th to 13th.

Western Gulf states.—6th to 16th.

Tennessee.—6th to 13th, 17th.

Ohio valley.—6th, 10th, 12th.

Lower lakes.—6th, 10th, 13th, 16th, 17th, 20th.

Upper lakes.—3d, 4th, 6th, 8th to 17th, 19th, 20th.

Extreme northwest.—5th, 8th, 10th.

Upper Mississippi valley.—5th, 8th, 10th, 12th, 15th, 17th.

Missouri valley.—4th, 9th to 12th, 15th, 17th to 20th.

Middle slope.—10th to 13th, 15th.

Southern plateau.—5th, 15th, 18th.

Northern plateau.—7th to 10th.

North Pacific coast.—8th to 12th.

Middle Pacific coast.—4th, 8th, 10th, 14th, 19th.

Lunar halos were also reported from the following stations not situated in the districts named above: